

OUR BOOK SHELF.

*Grundriss der qualitativen Analyse, vom Standpunkte der Lehre von den Ionen.* Von Dr. Wilh. Böttger. Pp. xii + 249. (Leipzig: W. Engelmann; London: Williams and Norgate, 1902.) Price 7s. net.

THIS work is intended to fill in the outlines sketched with such ability a few years ago by Prof. Ostwald in his little book on analytical chemistry. In that book it was shown how the facts and operations of analysis may be viewed in the light of physicochemical doctrines in general, and of the ionic theory in particular. Dr. Böttger now supplies the detail, so that a student may make his way over the whole territory of analysis hearing and speaking only the language of the new dualism.

It is probable that a casual examination of this book will arouse feelings of exasperation in the minds of those who think that the ionic theory should be kept in a state of suspended animation, and not used until somebody (at present unknown) has either made it perfect or else has shown that it is unfit to live. To those who see in the new dualism a theory which accords in a singularly complete way with the phenomena of analysis, Dr. Böttger's book will be extremely welcome.

It is too early yet to judge of the stamp of chemist that will be produced out of students whose whole chemical discipline has been in the school of thought represented by this book, but one thing seems certain in regard to analysis, and it is that such students will be habituated more than has ever previously been the case to look behind the mere reaction and learn something of the play of forces to which it is due. This will undoubtedly be a great gain, for the bane of analysis for educational purposes has been the tendency of people to regard it more as an art than as a science.

Dr. Böttger divides the subject under the usual headings—examination of a solution for the metallic constituents in the six analytical groups, examination of a solution for the anion in five groups, complete analysis of a given substance, solution and fusion of solids, rarer elements. A set of analytical tables is contained in a pocket inside the cover.

Very full explanations are given throughout of the individual reactions and of the separation processes, and short sections are devoted to such subjects as reversible reactions, mass action, solubility-product, &c.

It is probable that Dr. Böttger's book will for some time to come rank as the standard work on analysis as considered from the point of view of the ionic theory.

A. S.

*A Treatise on Roads and Pavements.* By Ira Osborn Baker, C.E. Pp. viii + 635; with 171 illustrations. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1903.) Price 5 dollars.

THE object of this book, as set out in the preface, is to give a discussion from the point of view of an engineer of the principles involved in the construction of country roads and city pavements. The contents of the book relate almost entirely to American practice, where, according to the author, 95 per cent. of the mileage of the public highways consists of earth roads, a form which has almost entirely vanished from this longer established country. To the making and manufacture of earth roads the author therefore devotes a considerable part of his book; the remainder deals with roads having permanently hard surfaces used in urban and suburban districts; this part also is based on American experience, because, to use the author's words, "the principles of road making worked out in America are probably best suited to American conditions, and also because in most par-

ticulars American roads and pavements are superior to any other in the world." Yet, notwithstanding this superiority over the rest of the world, which may be open to question, the author admits that even in America there is still room for improvement.

The book is divided into twenty chapters, dealing respectively with the location, making and management of earth roads; roads covered with gravel and broken stone; horse tracks; street pavements, their design, drainage, foundations, and materials for paving, including bricks, asphalt, cobble stones, granite and other cubes, wood and tar macadam; foot-ways and bicycle tracks.

Although the estimates of cost and methods of procedure do not apply to work done in this country, there is a great deal in the book that may be read with profit by English road engineers and surveyors. The information and statistics given in the chapter on traction might be useful to the committee of the British Association that is now engaged in considering this subject.

*International Catalogue of Scientific Literature.* Vol. v. First Annual Issue. Astronomy, E. Pp. xiii + 303. Published for the International Council by the Royal Society of London. (London: Harrison and Sons, 1902.) Price 21s.

READERS of NATURE are now familiar with the method adopted in classifying the subject-matter brought together in these annual volumes, seventeen volumes of which form a complete yearly issue of the catalogue. The work before us is the first of these annual issues dealing with astronomy, and one, therefore, of special interest to astronomers, as the latter are already well supplied with the valuable volumes of the *Astronomischer Jahresbericht* (published by Walter F. Wislicenus with the support of the Astronomischen Gesellschaft), which have now reached their third year, and contain in addition a brief abstract of nearly every paper.

Comparing the two volumes from the point of view of subject classification, there are some slight variations, which, however, make no material difference. On p. 1 of the volume before us "spectroscopy" seems to be added to the list of "primary divisions" as a kind of appendix, but on further investigation this arrangement, which is a very good one, seems to have been adopted since this subject is common to more than one of the primary divisions. Before using the book, the British reader is advised to read the instructions on pages xii. and xiii., and it seems curious that these instructions are not translated into French, German, and Italian, like the other portions of general information.

It is difficult to overestimate the importance of the present publication and its value to astronomers in aiding them to follow the work carried on in other countries.

*Der echte Hausschwamm und andere das Bauholz zerstörende Pilze.* By Dr. R. Hertwig. Second and enlarged edition, by Dr. C. F. von Tubeuf. Pp. vii + 105; illustrated. (Berlin: Springer, 1902.)

BOTH mycetologists and practical men will welcome the appearance of this second and revised edition of a well-known work dealing chiefly with the life-history of the fungus of dry rot (*Merulius lacrymans*) and the best modes of preventing its devastations, but likewise discussing other kinds of wood-boring funguses. In the first chapter the distribution of this fungus and the woods it chiefly attacks are discussed in detail, while in the second attention is concentrated on its mode of development, and the means by which its presence can be detected. Illustrations, one in colours, in the latter chapter show the appearance presented by

wood in an early stage of dry rot, while others depict the spores of the fungus. The life-history of *Merulius* forms the subject of the third chapter, in the course of which it is shown that moisture aids in its development and spread. The mode in which it affects wood, and the manner of its propagation, are discussed in subsequent chapters, after which the best methods of prevention are taken into consideration. A second and much shorter section of the work is devoted to the nature and ravages of *Polyporus vaporarius* and other wood-destroying funguses.

R. L.

*How to Work Arithmetic.* Parts i. and ii. By Leonard Norman. Second Edition. Pp. xvi + 77 in each part. (Rugby: G. E. Over, 1902.) Price 1s. 6d. net each.

THESE small volumes contain the same series of 136 "model problems worked in full by elementary, and advanced methods" respectively. In part ii., the shorter method of long division is adopted, which makes it preferable to part i., even for beginners; and questions which are solved by the "unitary method" in part i. are solved by "proportion" in part ii. The problems are, many of them, of a somewhat old-fashioned and useless character, and while the range is fairly comprehensive, the omission of examples of methods of approximation seems remarkable. There is a misprint in the recurring decimals which are "worth knowing"; the terms "odd" and "even" instead of "alternate" in the test of divisibility by 11 are apt to be misleading. Every pupil with a good teacher ought to make a collection like this for himself, but the books should prove useful to self-taught students.

*Untersuchungen über den Lichtwechsel Alcols.* By Ant. Pannekoek. Pp. xxiv+236. (Leyden: L. van Nijffurk, 1902.)

IN this volume the author has collected and discussed the chief observations of Alcol that have been made since the publication of John Goodricke's results in 1783.

The observations of Plassman, Argelander, Heis, Müller, Wilsing, the author and others are included, and the various methods of obtaining and interpreting the results are analysed and compared.

The construction of comparison-star light scales, photometric measurements, the magnitudes at, and the duration of, the maxima and minima, the construction of the light curves and their asymmetry, are amongst the other subjects which are discussed in detail.

There are two appendices, the first of which deals with the corrections which have to be applied to these observations, whilst the second gives the details of the observations of Plassman, Pannekoek, Argelander and Heis respectively, in tabular form.

W. E. R.

*My Nature Notebook.* By E. Kay Robinson. Pp. ii + 211. (London: Isbister and Co., Ltd., 1903.) Price 2s. 6d.

DURING 1902, Mr. Robinson contributed weekly a series of interesting "nature notes" to the *Daily Graphic*, and the fifty-two instalments are here re-published in book form. Under each week are to be found five or six short paragraphs, describing in a chatty way certain aspects of nature noticeable at that period of the year. To the intelligent person living in the country, such a book as this should prove of great use, for under the author's guidance there will be no difficulty in knowing what and how to observe, and quite a short experience of such personal observation will develop a love for plants and animals of many kinds.

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## LETTERS TO THE EDITOR.

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## Can Dogs Reason?

THE answer to the question, "Can an animal reason?" depends upon the sense in which the word "reason" is used. If dog-stories are to be accepted as evidence, the question must be answered in the affirmative, even though the most liberal, and human, significance be attached to the word. It is, however, of great importance that data should be obtained under conditions which can be rigidly controlled, in order that the credibility of anecdotes may be tested by the results of observations which can be easily repeated. Already excellent work has been done in this field by Lloyd Morgan, Thorndike, Small, Mills, Hobhouse, and others, but the science of animal psychology is still in its infancy.

That an animal can compare a sensation newly received with memories of sensations, and form a perceptual judgment, which leads to action suitably adapted to its circumstances, no one doubts; but this is hardly reasoning in the usually accepted meaning of the term. We may, for the sake of simplicity, term the forming of a perceptual judgment putting one and one together. But can an animal compare an inference with an inference? Is it capable of what we term the syllogism, when speaking of human thought? Can it "put two and two together" within the

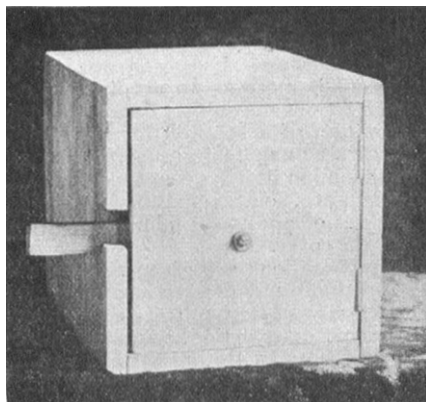


FIG. 1.

common meaning of this phrase? I am, of course, conscious of the absurdity of applying the term syllogism to the wordless thought of an animal, and also of the fact that a perceptual judgment may be expressed in syllogistic form, but my meaning will, I think, make itself sufficiently clear in the description of the following experiment:—

An exceptionally intelligent fox terrier was taught to open a box by lifting a wooden latch with its nose. Some care was spent upon the design of this box (Fig. 1). The latch was in the first instance long, and therefore easily lifted. Behind the door was placed a spiral spring, which could be twisted until it exerted any degree of pressure which seemed desirable. As the dog learnt to lift the latch, the length of the latch was curtailed. At the same time the spring was tightened until it pressed against the door with a degree of force which made the latch so stiff that the dog could not lift it without deliberate effort. There was no risk of its being opened by a chance movement. The dog was rewarded with food for performing the trick, which soon became so familiar as to be a game. As often as the door was closed the dog opened it. If he found the box on the floor he invariably opened it without waiting for any sign.